day 11

$$\lim_{x\to\infty} \frac{e^x+3}{4e^x-2} = \lim_{x\to\infty} \frac{e^x\left(1+\frac{3}{e^x}\right)}{e^x\left(4-\frac{2}{e^x}\right)} = \lim_{x\to\infty} \frac{1+\frac{3}{e^x}}{4-\frac{2}{e^x}} = \frac{1}{4}$$

$$\lim_{x\to-\infty} \frac{e^x+3}{4e^x-2} = \lim_{x\to-\infty} \frac{\frac{1}{e^{-x}}+3}{\frac{4}{e^{-x}}-2} = -\frac{3}{2}$$

0

0

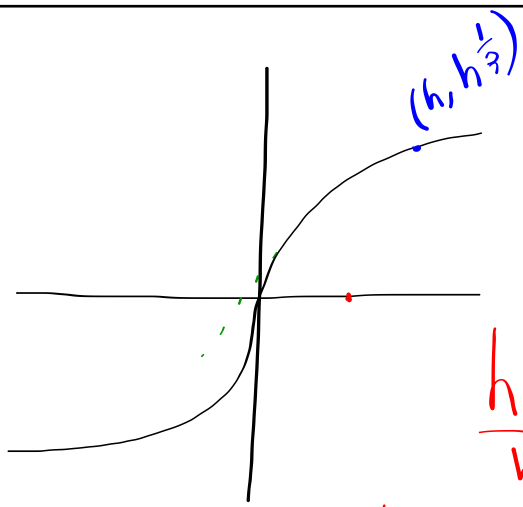
$$\lim_{x\to-\infty} \frac{e^x\left(1+\frac{3}{e^x}\right)}{e^x\left(4-\frac{2}{e^x}\right)}$$

when $x<0$ then $e^x = \frac{1}{e^{|x|}}$

2.4 46)

day 11

$f(x) = x^{\frac{1}{3}}$



a) $m = \dfrac{h^{\frac{1}{3}} - 0}{h - 0} = h^{-2/3}$

$\dfrac{h^{1/3}}{h} = h^{\frac{1}{3} - 1} = h^{-2/3}$

b) $\lim\limits_{h \to 0^+} h^{-2/3} = +\infty$

$h^{-2/3} = \dfrac{1}{h^{2/3}} = \dfrac{1}{(h^2)^{1/3}}$

$\lim\limits_{h \to 0^-} h^{-2/3} = +\infty$

day 11

$f(x) = x^{2/3}$

$m = \dfrac{h^{2/3} - 0}{h - 0} = h^{-1/3} = \dfrac{1}{h^{1/3}} = \dfrac{1}{\sqrt[3]{h}}$

b) $\lim\limits_{h \to 0^+} \dfrac{1}{\sqrt[3]{h}} = +\infty$

$\lim\limits_{h \to 0^-} \dfrac{1}{\sqrt[3]{h}} = -\infty$

day 11

50

$$g(x) = 2 - \ln x^2$$
$$= 2 - \ln(x^2)$$

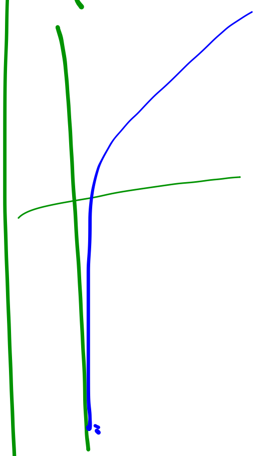
$$\lim_{x \to 0} 2 - \ln(x^2) \qquad 0 < x < 1$$

$$2 - (-\text{big number})$$

$$= +\infty$$

ln x

problems?



day 11

domain restriction
possible vertical asymptotes
problems

- denominator = 0
- $\sqrt{\text{negative \#}}$
- $\ln x$
  $x = 0$ or negative
- $\tan x$, where $\cos x = 0$
  $x = \frac{\pi}{2} \pm n\pi$

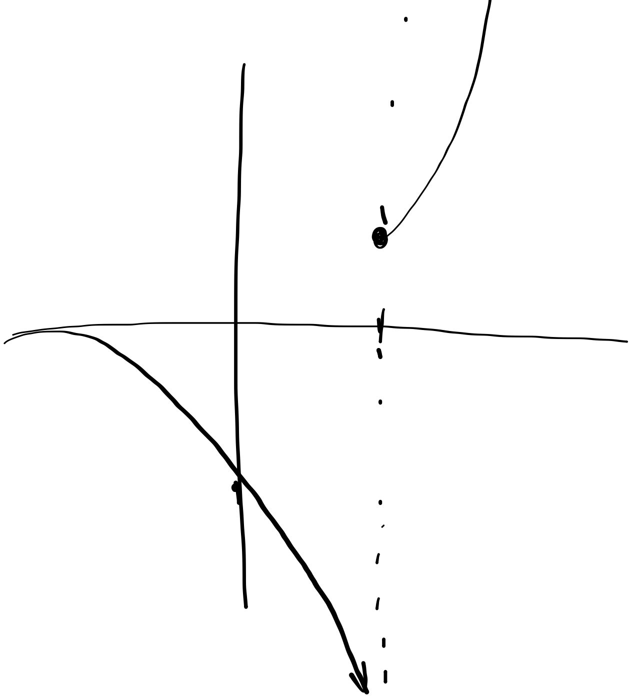
Sep 12-7:07 AM

day 11

2.4/57

2.4/3.19

$$f(x)=\begin{cases} \dfrac{4}{x-1} & \text{if } x<1 \\ x^2 & \text{if } x\geq 1 \end{cases}$$



Sep 12-7:07 AM

day 11

2.5/48

$$\lim_{x\to\infty} \frac{\sqrt{16x^4+64x^2}+x^2}{2x^2-4} =$$

$$= \lim_{x\to\infty} \frac{\sqrt{16x^2}\sqrt{x^2+4}+x^2}{x^2\left(2-\frac{4}{x^2}\right)} = \lim_{x\to\infty} \frac{|4x|\sqrt{x^2+4}+x^2}{x^2\left(2-\frac{4}{x^2}\right)}$$

$$= \lim_{x\to\infty} \frac{4x\sqrt{x^2+4}+x^2}{x^2\left(2-\frac{4}{x^2}\right)} = \lim_{x\to\infty} \frac{x\left[4\sqrt{x^2+4}+x\right]}{x^2\left(2-\frac{4}{x^2}\right)}$$

$$= \lim_{x\to\infty} \frac{4\sqrt{x^2+4}+x}{x\left(2-\frac{4}{x^2}\right)} = \lim_{x\to\infty} \frac{4\sqrt{x^2}\sqrt{1+\frac{4}{x^2}}+x}{x\left(2-\frac{4}{x^2}\right)}$$

$$= \lim_{x\to\infty} \frac{4x\sqrt{1+\frac{4}{x^2}}+x}{x\left(2-\frac{4}{x^2}\right)} = \lim_{x\to\infty} \frac{x\left(4\sqrt{1+\frac{4}{x^2}}+1\right)}{x\left(2-\frac{4}{x^2}\right)}$$

$$= \lim_{x\to\infty} \frac{4\sqrt{\left(1+\frac{4}{x^2}\right)}+1}{2-\frac{4}{x^2}} = \frac{4(1)+1}{2} = \frac{5}{2}$$

Sep 12-7:07 AM

day 11

2.5/48

$$\lim_{x\to-\infty} \frac{\sqrt{16x^4+64x^2}+x^2}{2x^2-4} =$$

$$= \lim_{x\to-\infty} \frac{\sqrt{16x^2}\sqrt{x^2+4}+x^2}{x^2\left(2-\frac{4}{x^2}\right)} = \lim_{x\to-\infty} \frac{|4x|\sqrt{x^2+4}+x^2}{x^2\left(2-\frac{4}{x^2}\right)}$$

$$= \lim_{x\to-\infty} \frac{-4x\sqrt{x^2+4}+x^2}{x^2\left(2-\frac{4}{x^2}\right)} = \lim_{x\to-\infty} \frac{x\left[-4\sqrt{x^2+4}+x\right]}{x^2\left(2-\frac{4}{x^2}\right)}$$

$$= \lim_{x\to-\infty} \frac{-4\sqrt{x^2+4}+x}{x\left(2-\frac{4}{x^2}\right)} = \lim_{x\to-\infty} \frac{-4\sqrt{x^2}\sqrt{1+\frac{4}{x^2}}+x}{x\left(2-\frac{4}{x^2}\right)}$$

$\sqrt{(-2)^2}$

$=+2$

$$= \lim_{x\to-\infty} \frac{-4(-x)\sqrt{1+\frac{4}{x^2}}+x}{x\left(2-\frac{4}{x^2}\right)} = \lim_{x\to-\infty} \frac{x\left(4\sqrt{1+\frac{4}{x^2}}+1\right)}{x\left(2-\frac{4}{x^2}\right)}$$

$$= \lim_{x\to-\infty} \frac{+4\left(\sqrt{1+\frac{4}{x^2}}\right)+1}{2-\frac{4}{x^2}} = \frac{+4(1)+1}{2} = \frac{5}{2}$$

Sep 12-7:07 AM

claim: $\sqrt{x^2+4} = x+2$

Q: how could we show this?

square it

$$x^2+4 = (x+2)^2 = (x+2)(x+2) = x^2+4x+4$$

graph both

2.5
70) $\{4, 2, \frac{4}{3}, 1, \frac{4}{5}, \frac{2}{3}, \ldots\} = \{a_n\}$

$\lim_{n\to\infty} \{a_n\} = \lim_{n\to\infty} \frac{4}{n} = 0$

71) $\left\{\frac{n-1}{n}\right\}_{n=1}^{\infty}$ $\lim_{n\to\infty} \frac{n-1}{n} = \lim_{n\to\infty} 1 - \frac{1}{n} = 1$

$$n \overline{)\,n-1\,}\quad \text{quotient } 1 - \frac{1}{n};\quad -n;\quad -1$$

remainder

divisor

$$\frac{n(1-\frac{1}{n})}{n(1)}$$

72 ∞

73 0

75 0
∞

25) $\lim_{x\to\infty}$ . . . . . $= \lim_{x\to\infty} \dfrac{e^{2x}\left(2/e^{x}+3\right)}{e^{2x}\left(1+e^{x}\right)}$

$\lim_{x\to-\infty}$ . . . . . . $= \lim_{x\to-\infty} \dfrac{e^{2x}\left(\frac{2}{e^{x}}+3\right)}{e^{2x}\left(1+e^{x}\right)}$

2.5 | 42-43
35-36